

CONTACT INFORMATION  
Mining Records Curator  
Arizona Geological Survey  
416 W. Congress St., Suite 100  
Tucson, Arizona 85701  
520-770-3500  
<http://www.azgs.az.gov>  
[inquiries@azgs.az.gov](mailto:inquiries@azgs.az.gov)

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Doctet no ND-5267

Dear Mr. Tully:

Re: Apex Mining Company,

1828 Liberty Bank Bldg.

Buffalo, New York

Enclosed is my report on the examination of the above captioned mine located near St. George, Utah.

The examination was good procedure over the usual routine examinations because the War Production Board is interested that the mine maintain its present output.

The mine is a very old property and has never had an examination by the U.S. Geological Survey or the Bureau of Mines. I was handicapped in my geological examination in not being able to study the local geology on the surface because of snow and of the underground workings above the 1400 level because of scaring.

As the company is not interested in mining above the 1400 level a development program was laid out based on the geological evidence seen on the 1400 level.

I have recommended that a loan be given the applicant based on what evidence was available. You have engineers in your office who have had experience in this type of mine at Butte, Montana

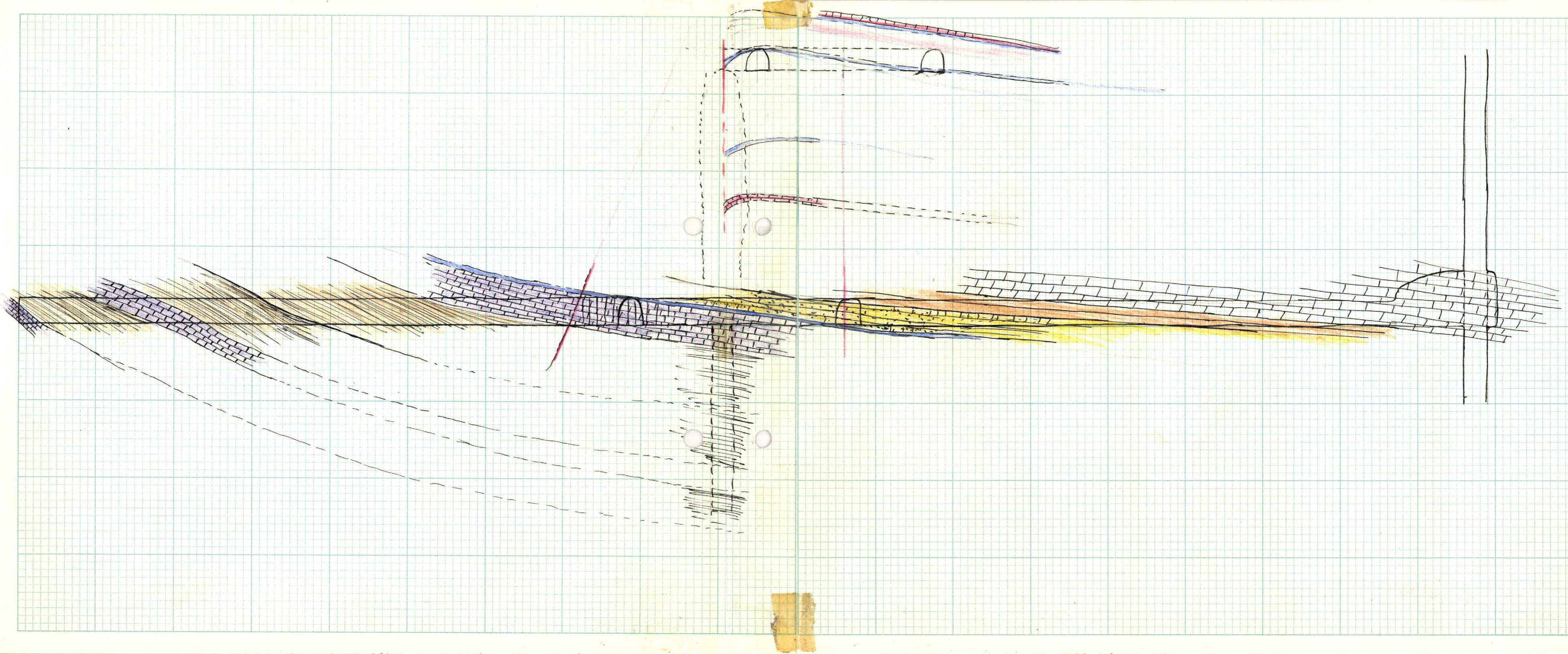
and recognizing the difficulties of carrying  
out a development program in limestone  
horizons which have never been cut  
by a shaft and explored. The only way  
of determining whether or not a bed is  
susceptible to ore replacement is to drive  
and find out. Great masses of sandstone  
and agglomerates have been found for  
1400 feet vertically in this mine and  
apparently there were a number of limestone  
beds replaced by the copper solutions.  
Indeed there are thousands of more  
feet of underlying limestone beds  
some must certainly be replaced but  
to ascertain which particular beds will  
be replaced is an impossibility.

Charles A. Pease

, Sup. C. Report

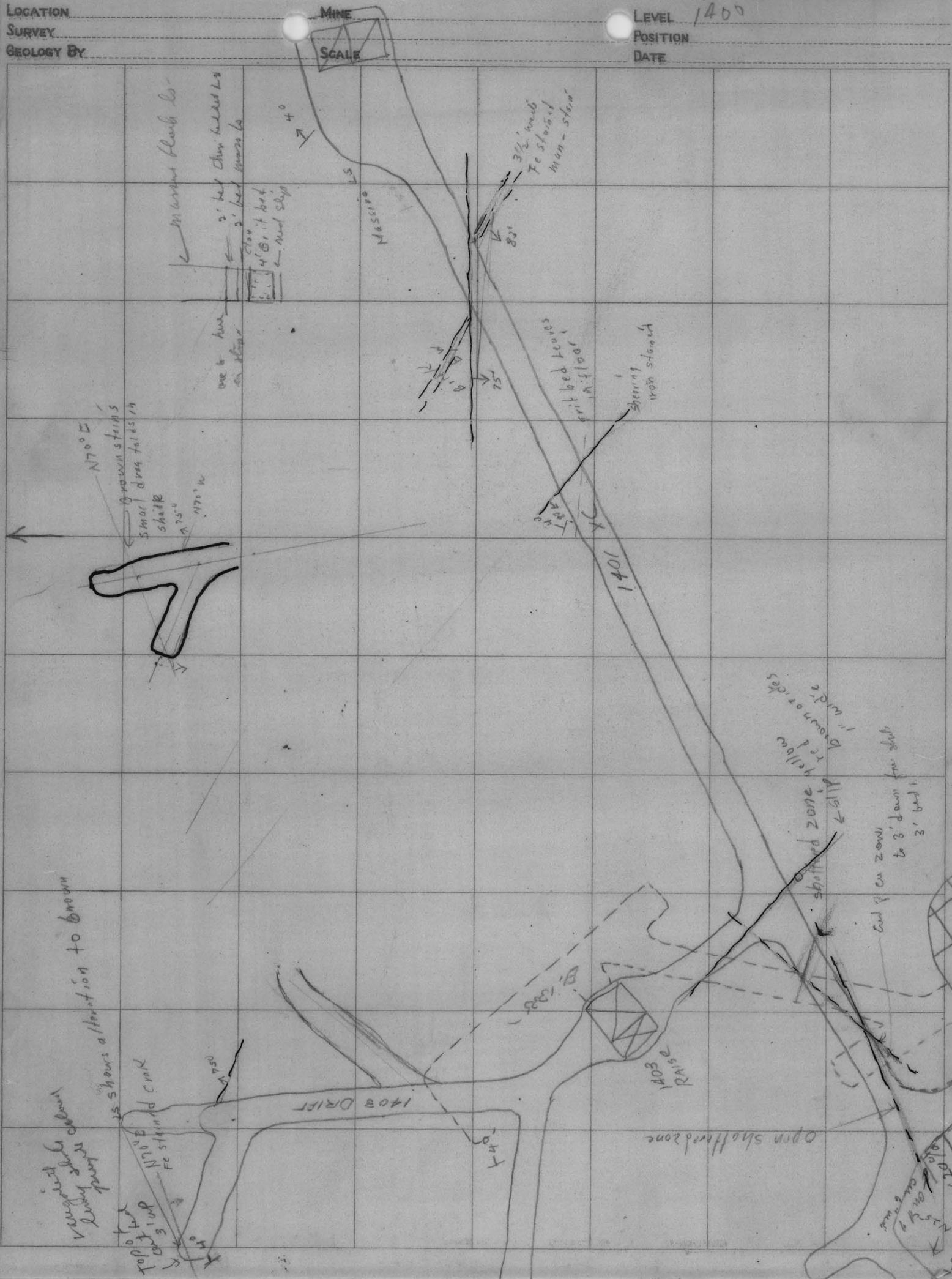
2. On board applications and suggestions  
dots

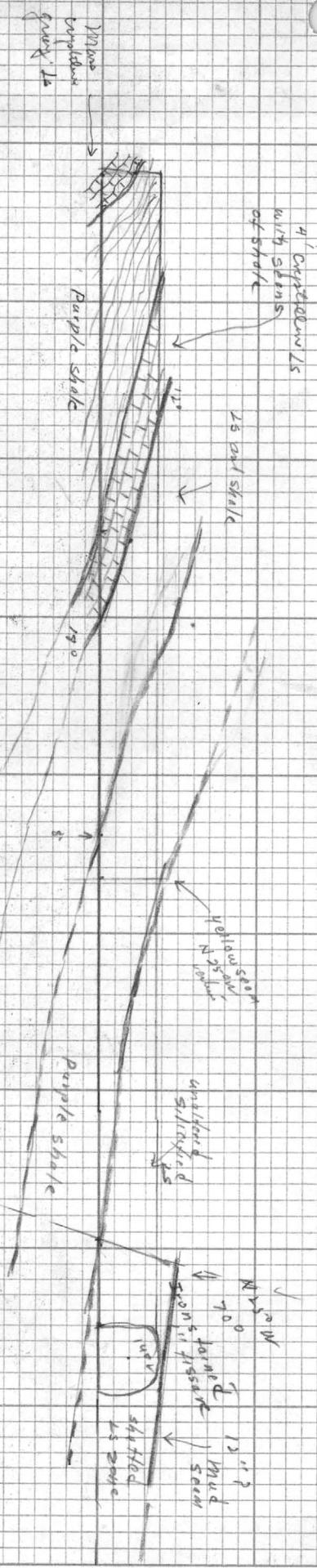
six loose mini maps and vertical sections

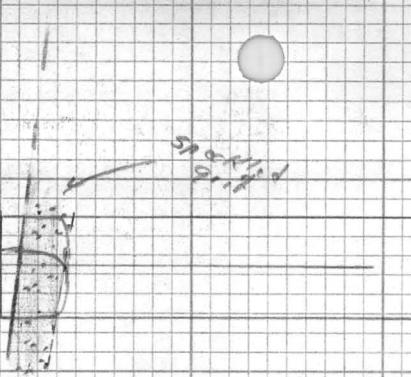


LOCATION  
SURVEY  
GEOLOGY BY

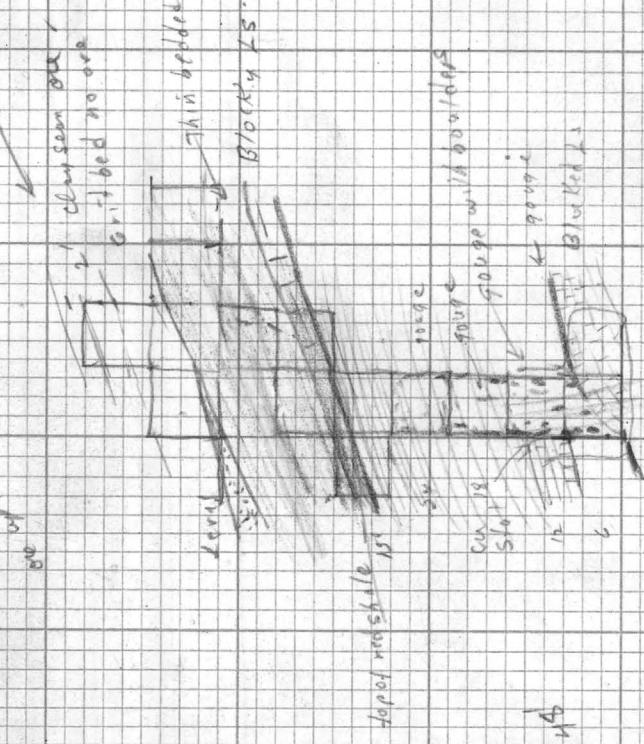
LEVEL 1400  
POSITION  
DATE







A 100 ft. 100 ft. 100 ft. 100 ft.



Total thickness 10 ft  
Soil 1' → 1' thick sand layer  
1' thick gravel layer → 1' thick sand layer  
1' thick gravel layer → 1' thick sand layer



12/10/29, 05

Block  
25  
1' thick sand layer

LOCATION  
SURVEY

GEOLOGY BY

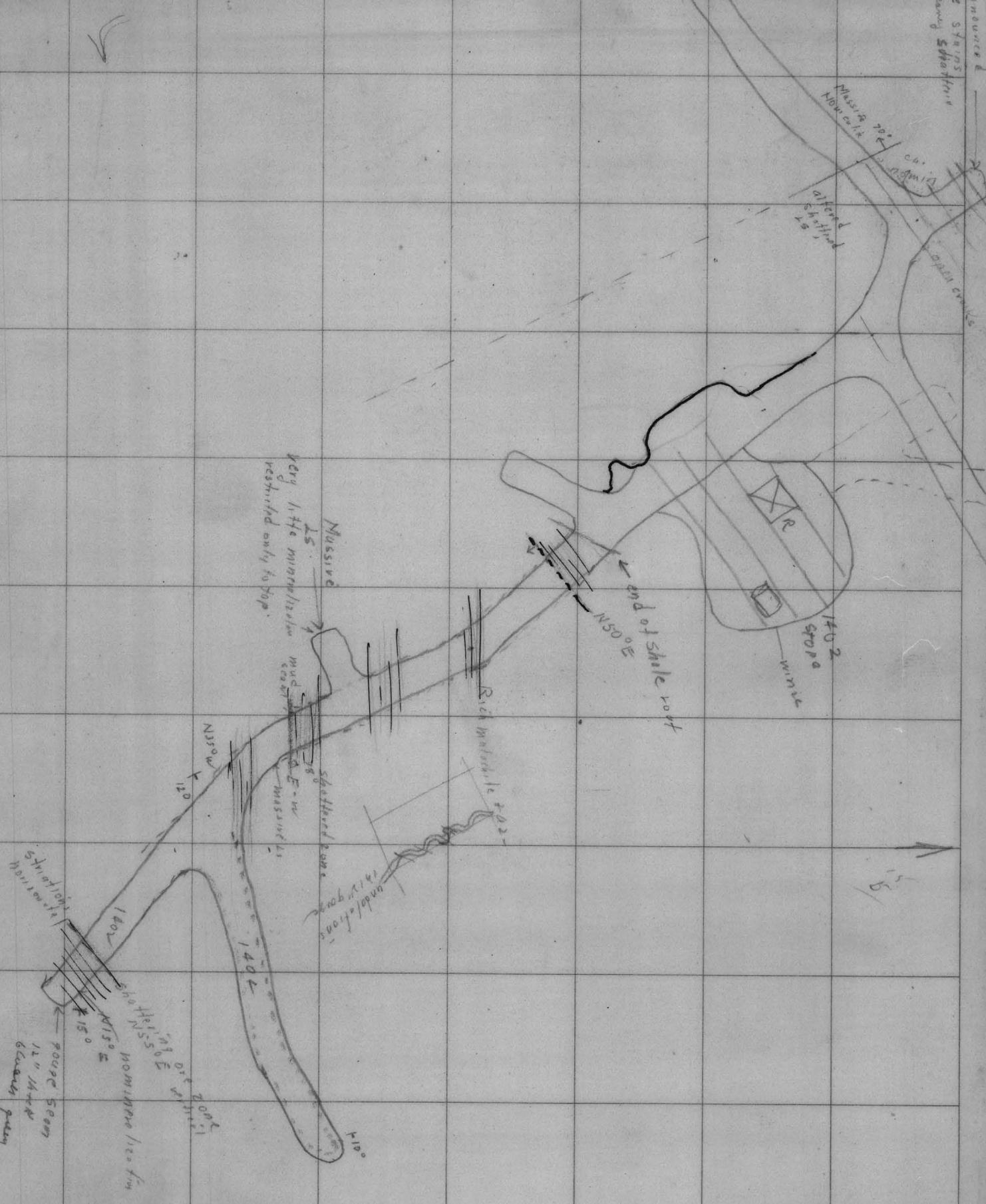
MINE

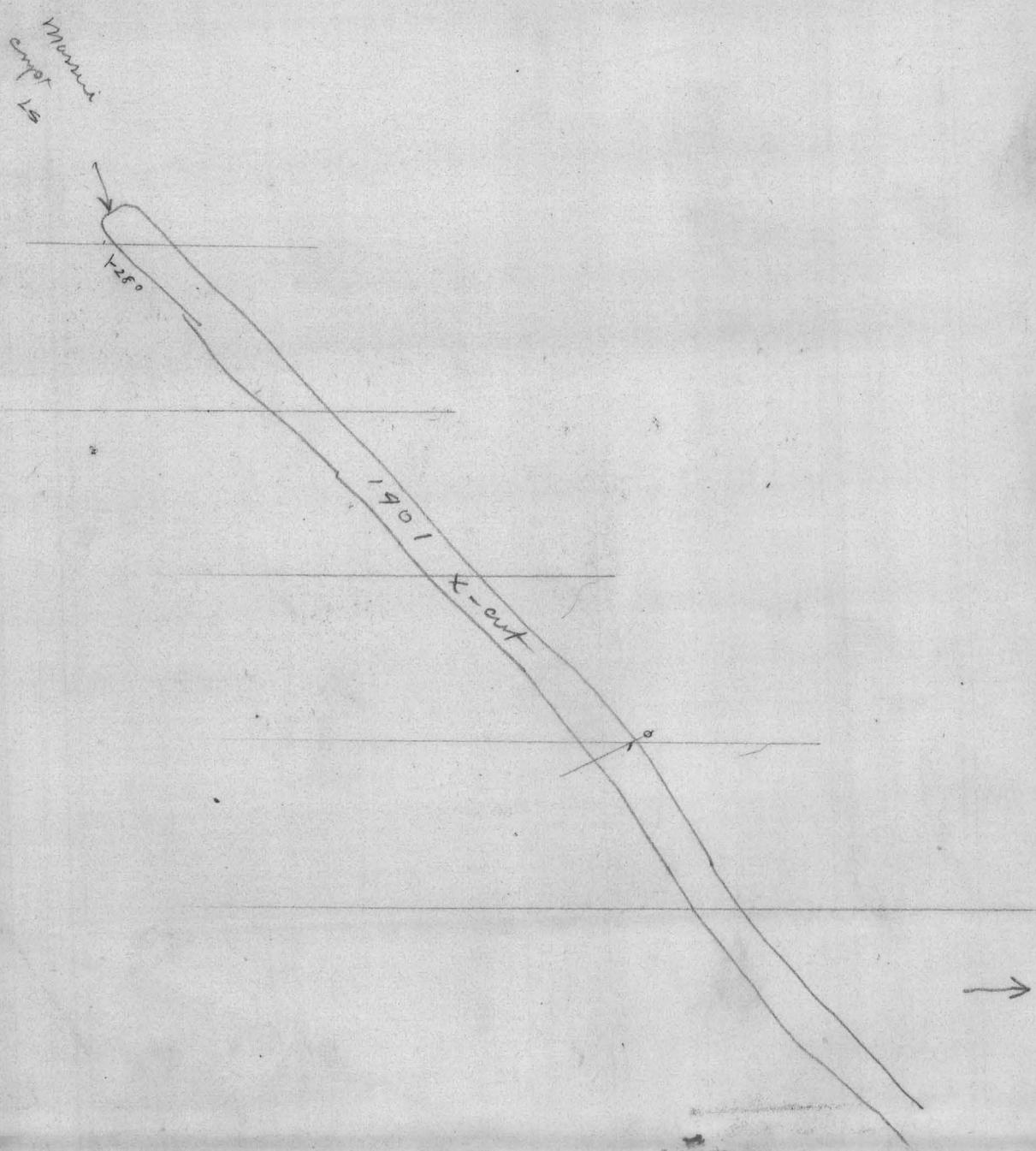
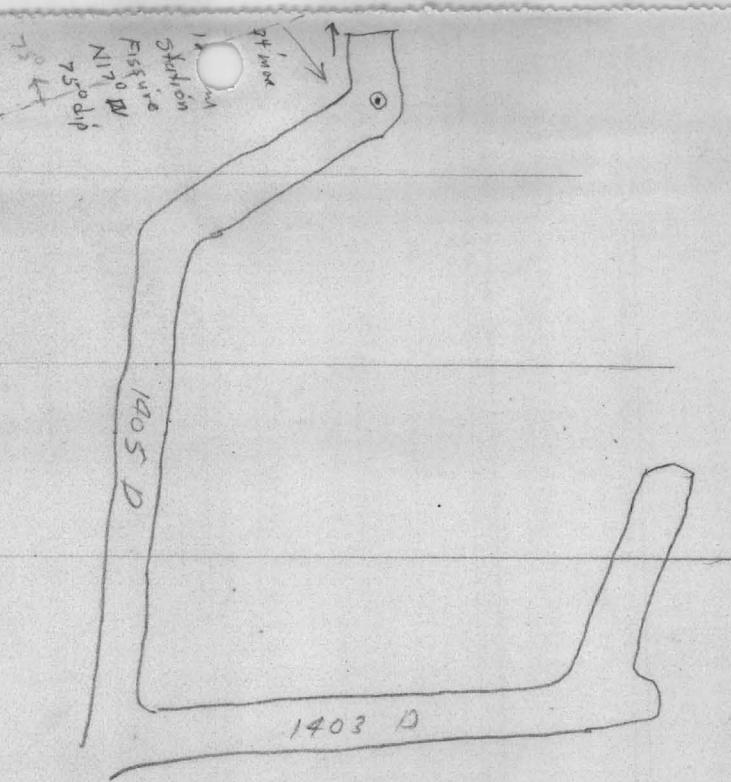
SCALE

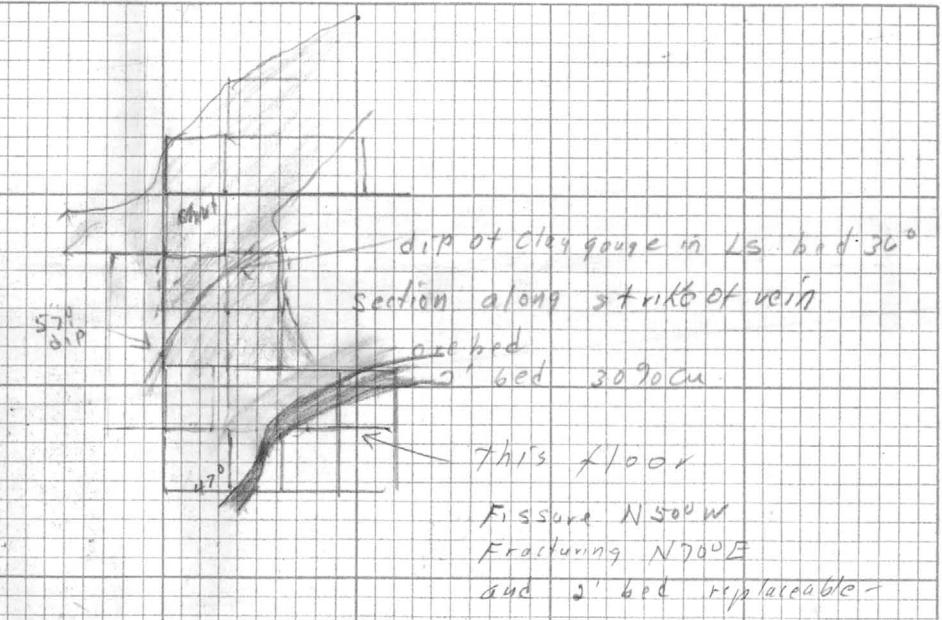
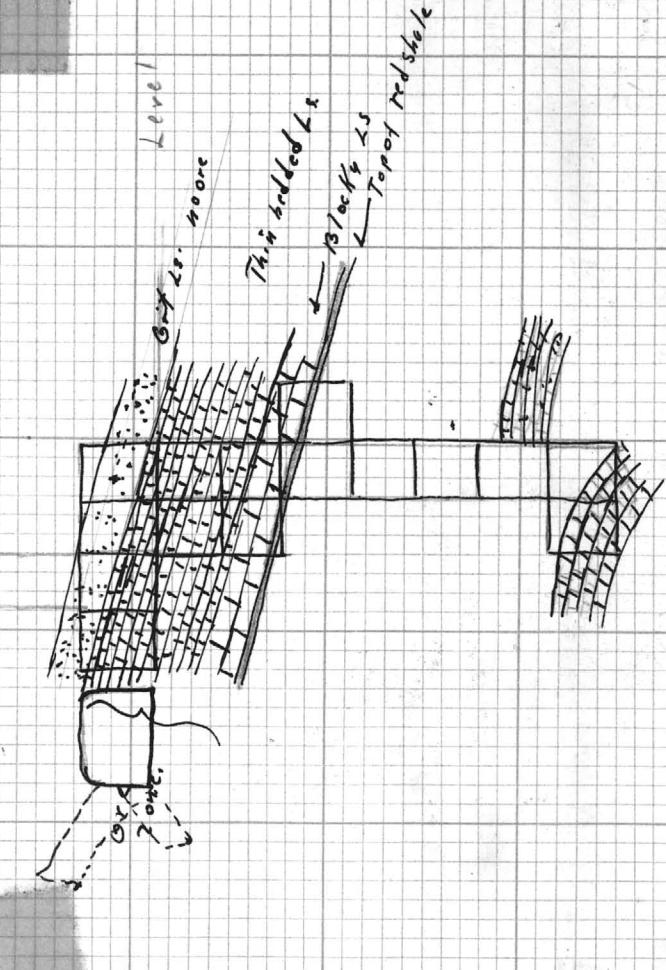
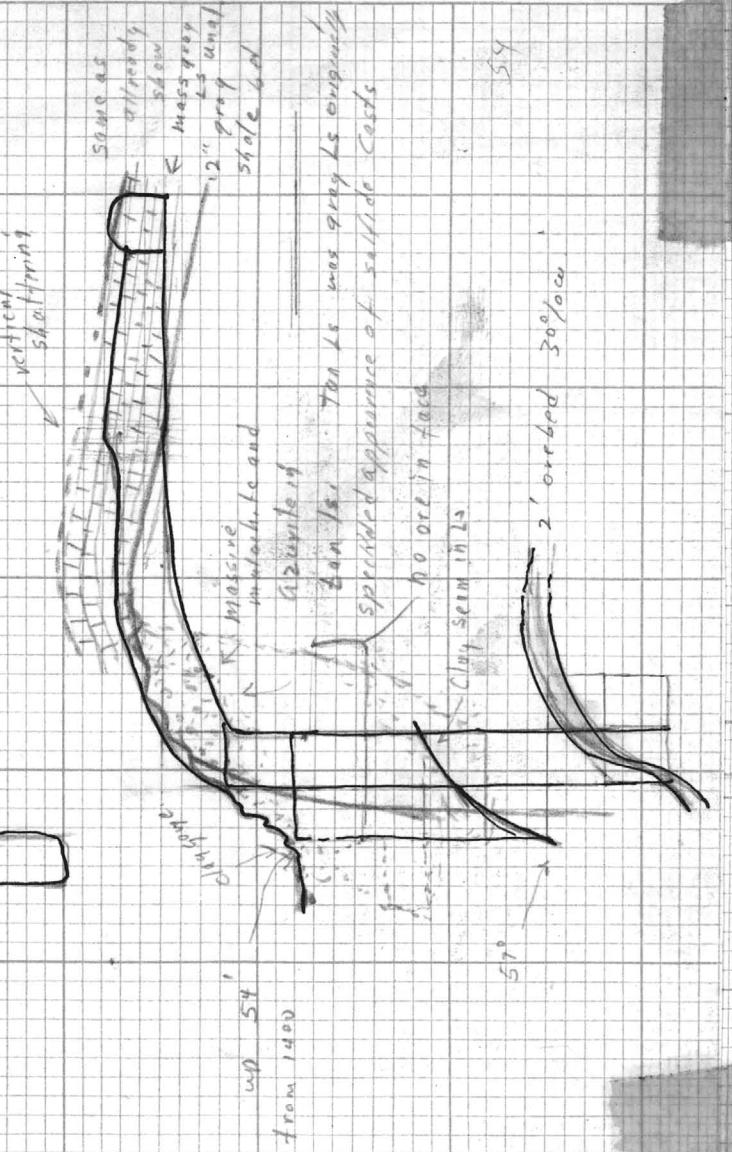
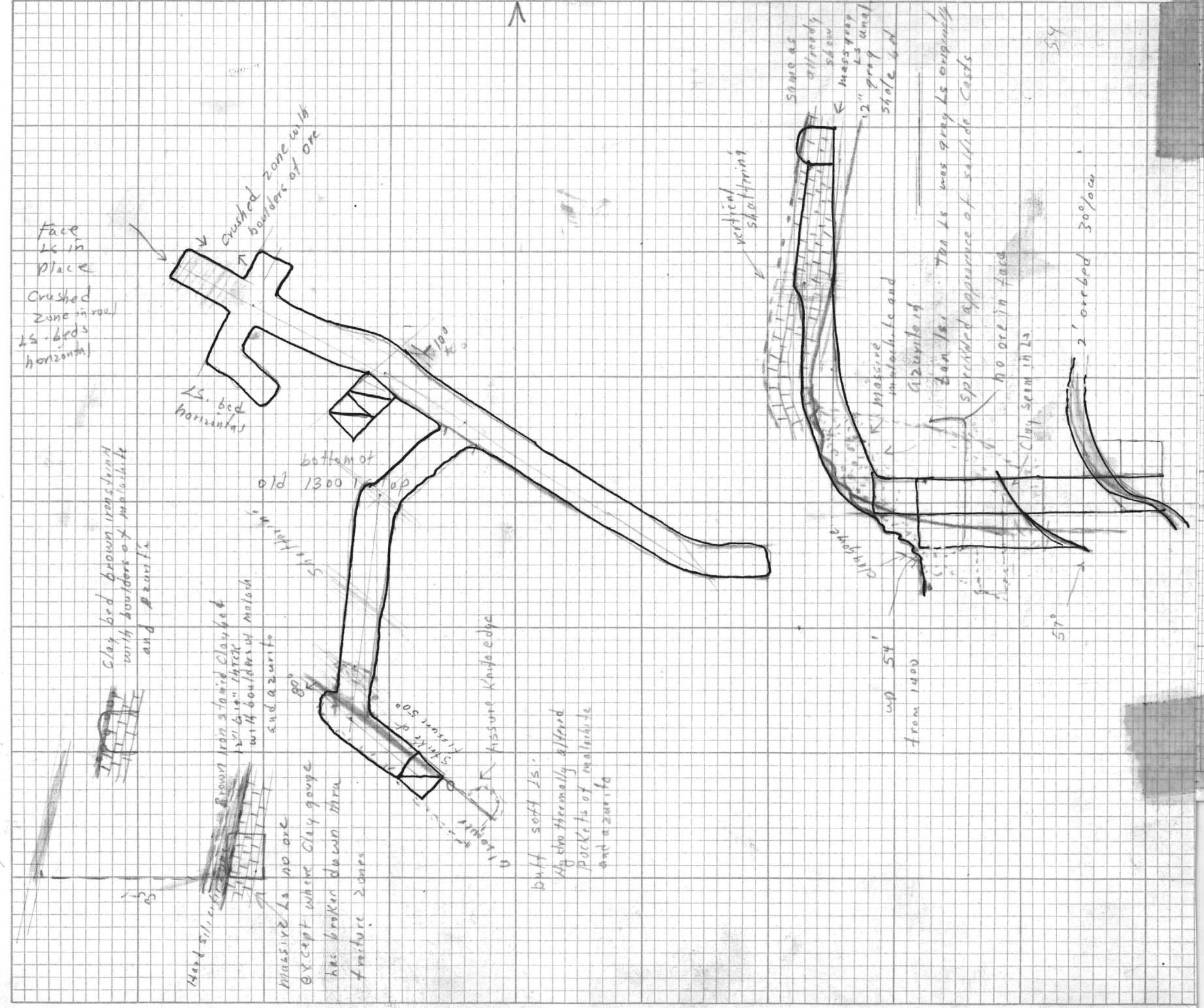
POSITION

DATE

LEVEL







above ore horizon all  
some kind of soft brown  
is -  
ore horizon in different ls

ls - back soft brown ls  
3-4" grey clay gouge  
12" brown buff ls. soft  
2" grey clay seam  
Brown buff limestone 12" soft

6" clay seam shows movement  
ore zone  
Dark gray brittle ls  
with seams of malachite  
silicified - shattered zone

going south from 140°  
mineralization got weaker  
in carbonates. Left the upper  
part of the zone entirely  
3' from top some malachite  
was found replacing zone

slabby grey brown ls  
12" thick  
shatter ls some ore horizon  
in places about 140° south  
from 140°

shattering in ore zone  
N 55°E vertical  
does not penetrate clay  
gouge above clay gouge  
strikers horizontal

Ore definitely stops  
at top of bed

Azu. Fe

some brown pyrite  
but not extensive

Clay gouge above which contains  
no mineralization - concreted

Malachite stains

Apex Mining Company  
1828 Liberty Bank Building  
Buffalo, New York

THE DIXIE APEX COPPER MINE

Report by W. H. Hendrickson, E. M., Mining Engineer,  
Milford, Utah.

The Apex mine, sometimes known as the Dixie-Copper, owned by the liquidating trustees of Utah Southern Mining Company, address care of Mr. Harry E. Ross, Secretary, 129 Church Street, New Haven, Conn., is composed of twelve patented claims: - Apex, Morning Star, Hidden Treasure, Last Chance, Home Station, Lime-stone, Champion, Evening Star, Sentinel, Home Pickett, Highland Mary, White Elephant, - all U. S. Patent Survey No. 4329, and one unpatented claim, Azurite.

The mine is situated in Tutsagubet Mining District, Washington County, Utah, southwest of St. George City 19 miles by road, in the east slope of Beaver Dam mountains at an elevation of about 6000 feet with rugged topography.

It was discovered in 1876 and mined steadily until 1908. The larger production was made by Utah and Eastern Copper Company, predecessor to the present owners, who treated the ore at their smelter at Shem, 12 miles north of the mine, on Santa Clara Creek. It was re-opened in 1916, with intermittent small production to date.

The country rock is limestone, probably Carboniferous, of flat westerly dip at the mine, with anticlinal dips north and south of the mine. Monzonite occurs a few miles to the west.

The ore-deposit is secondary enriched copper, mainly azurite and malachite of high grade, with some native copper, copper oxide, and copper silicate. The ore carries small values in gold and silver, and small percentages of lead and zinc. The gangue is limonite iron with some quartz.

There is evidence that there was an original primary vein of chalcopyrite, at least three miles in length, of strike N.  $42^{\circ}$  W., dip  $68^{\circ}$  SW, which was faulted at the site of the mine by at least two faults of N.  $10^{\circ}$  W. strike,  $85^{\circ}$  W. dip, and was also faulted there with small movement by at least three crossbreaks of northwest to westerly strike, the mine being in the broken and cross-fissured crest of an anticline, the resultant excessive erosion having allowed the secondary concentration of mineral in the brecciated limestone surrounding the original vein.

COPY

The ore-bodies were connected pockets with a vertical habit, of size up to forty feet wide, sixty feet long, and one hundred feet vertical, lying in a stretch of the vein about 300 feet long, or about 150 feet both north and south from the main shaft. Mining has been carried to a depth of 1330 feet south of the shaft and to a depth of about 1050 feet north of the shaft. All of the stopes are caved.

The workings are an upper tunnel 250 feet below the outcrop, connecting to a winze incline shaft in the vein about 800 feet deep, (the incline shaft is caved) and a lower tunnel 500 feet below the outcrop and 850 feet long which connects with the present working vertical three-compartment shaft in the solid limestone footwall, the shaft bottoming on 1100 level, with levels at 500, 600, 750, 900 and 1100 feet.

Two large ore-bodies were mined through winzes in the vein below 1100 level south of the shaft to 1330 foot depth, discontinuing in 1932 with the slump in the copper market. The stopes and winzes there have caved. A new winze has been sunk 60 feet below 1100 level north of these stopes. Production from this winze was stopped by the Utah State Mine Inspector, Mr. E. A. Hodges, by condemning the use of the hoist engine on the shaft, an internal combustion engine. The total footage of development work is unknown but from fragments of old maps the total of drifts and cross-cuts probably exceeds 10,000 feet.

As to the ore production, the mine records previous to 1908, which was when large production ceased, have been lost. The United States Geological Survey Bulletin No. 871 states that the total production, including 1932, for Tutsagubet District, of which the Apex has been practically the only producing mine, was \$1,907,863.00. This may mean \$1,900,000.00 for the Apex, including 1932.

The sum smelter cheques, from 1932 to date is \$9,249.25, giving total production of \$1,909,249. The production, or sum of smelter cheques since 1908 to date is \$178,933.88, leaving \$1,730,315. - as the production which was smelted locally.

From various evidence the average grade of the ore mined and smelted at Shem was 12% copper.

The mine and smelter shut down in 1908. The mine was worked from the outcrop to 1050 feet depth both north and south of the shaft, and from 1050 to 1300 foot depth south of the shaft, previous to the shut-down in 1908. From 1916 to date another orebody south of the shaft has been worked from 1200 to 1330 depth.

To estimate the production per foot of depth, in subtracting the production from 1050 to 1300 previous to 1908, estimated at 8,000 tons at \$20.00 per ton or value of \$160,000.00 - from \$1,730,315.00 - leaves \$1,570,315.00 - as the production to 1050 depth. With value of \$20.00 per ton this is 78,515 tons or 74.8 tons per foot of depth to 1050.

The production since 1908 from 1200 to 1330 depth totals 3905 tons with smelter cheque total of \$178,933.88 or \$45.80 per ton, average assay 27.8% copper. Adding to this the production from 1050 to 1300 made previous to 1908, 8000 tons at \$20.00 - \$160,000.00 of 12% copper, - the production from 1050 to 1330 south of the shaft was 11,905 tons averaging 17.2% copper or 42.5 tons per foot of depth.

The part of the vein from 1050 to 1330 north of the shaft has not been mined.

The ore continues down on 1330 and to the north in drifts from the 1160 winze. Since the outcrop of the vein shows for three miles, and since a width of vein of forty feet is fairly uniform from outcrop down with extensive leaching, and since there is no evidence of any impending change of formation or increase of water, the ore-bodies may be expected to continue in depth with the possibility of increased richness as the sulphide zone is approached.

Permit Application Form No. 1

D

Docket No.

ND-5267

Date application filed for Exam Recd. Jan. 27, 1943

Date of Examination, recd. Feb 3, 4, 5, 1943

Date of Report Feb 12, 1943

1. Name and address of applicant

Apex Mining Company,

1828 Liberty Bank Building

Buffalo, New York,

Correspondent:

H. W. Patterson

same address

2. Character of Project

To develop copper ore by cross cutting,  
raising and sinking.

3. Location of Mine:

In Sections 1 and 12, T. 43 S. R. 18 west

and Sections 6 and 7, T. 43 S. R. 17 W.

Tutsugabet mining district Washington

County, W. Va. The nearest railroad

station is Cedar City, W. Va. A distance

of 74 miles from the mine. Road

conditions are good and will be better

when a road is constructed from the

mine directly to Highway 91 west

of St. George, W. Va.

2.1

4. Applicant

Applicant is competent to handle the loan fund, applicant has an excellent operating personnel at the mine which is at present mining copper from an old stope.

5. Loan Requested

30,000.00

6. Description of Project.

A. General Features

Company, complies with state compensation and safety first statutes, has no legal discrepancies to its title. There are no uninclosed right-of-way facilities or likelihood of surface or sub-surface trespass.

B. Existing Development

1. shaft mine

(a) The Dixie area is a shaft mine and the entrance to the top of the shaft is through an 800 foot adit tunnel approximately 500 feet below the outcrop of the vein; the shaft is 906 feet below the main tunnel level and is bottomed on the 1400 foot level, 1400 feet below the outcrop.

(3)

The only level examined was the 1400 level. Other levels are open to the ore body but at that point are completely caved.

(6) Sampling

Your engineer did not take any samples of ore for the following reasons:

- ① A vein does not occur which can be marked off in sections and sampled off.
- ② Ore occurs in bedding planes but there are no stopes opened available for sampling. Besides these bedding stopes are not continuous for any known length.
- ③ The ores are <sup>all the</sup> rich carbonates of copper, malachite and azurite, <sup>and are</sup> formed by the movement of sulfite solutions of copper with the limestone beds.
- ④ All the beds are nearly horizontal or dip from 4 degrees to 10 degrees, thus each 100 feet of depth exposes unknown formations which may or may not be susceptible to replacement by the copper sulfite solutions.
- ⑤ These copper carbonate extend for 1400 feet beneath the outcrop which is an unusual occurrence and therefore unpredictable.

⑥ There is no evidence of primary mineralization.

⑦ Therefore, future probabilities of ore are uncertain but it seems that the previous yield from the mine and the present mining operations should be taken into account. Furthermore replacement ore bodies can be easily missed and accidentally hit and are generally found by systematically crosscutting and passing section through the limits of the ore zone.

The applicant has submitted an assay plan of the 1400 level which shows 31 samples taken by channeling along a length of 5 feet in the side walls of the 1402 south drift. This bed has been replaced by traveling copper amalgam solutions and should be worked on for local concentrations.

The applicant has shipped 518 tons of 20.39% copper ore from the 1402 stope and is still mining ore from here. The applicant has failed to explore the outer limits of this stope.

The applicant has data, supported by statement sheets, that 3500 tons of 30% copper ore were taken from the 1402 range extending from the 1400 to the 1300 levels. This ore was left

Comments of Supervising Engineer:

The examination of this mine was given precedence over the usual routine examinations because the Copper Division of the War Production Board is interested in having this mine maintain its present copper production.

The applicant has spent 150,000 in placing this old but extremely interesting mine in first class condition by building a 14 mile power line to equip electrically the surface and underground workings, by installing an electric driven hoist with a new 1400 foot cable in length and by sinking 800 feet in the vertical shaft and doing some development from the bottom of the shaft enabling the applicant to ship 200,000 pounds of copper from September 1942 to January 1943.

There are a number of levels off from the shaft which are open to the ore zone but which are closed in the bore zone. Old maps show the ore zone extending from the surface to the bottom of the 1330 stage; all this work was done prior to 1908 except for

in the walls of the ad. stope mined previous to 1908.

(C) Condition and accessibility of mine workings.

Except for the 1400 level all the other levels are leaded at the intersections of the levels with the ore zone. The shaft is in excellent condition as does the 1400 level, all levels leading to the shaft and from the shaft to the ore zone are in good condition.

(d) General features of deposit.

The Dixie ages mine is an ore deposit of secondary enriched copper. The ore minerals are exclusively malachite and azurite and the richness of the ore can be gauged by studying the settlement sheets from the smelter.

Great thicknesses of limestone alternating with clayey shale beds make up the country rock. The age of the rocks is either Pennsylvanian or Pennsylvanian.

From a study of the 1400 level and from a short level can be seen on some of the upper levels the ore occurs in irregular shaped stopes in the V of intersecting fissures.

done some ~~work~~ along the outer edge of the stopes extending from the 1100 level to the 1300 level between 1918 and 1937. Applicant has smaller shipment sheets to show that 3500 tons of 30 per cent ore was taken out.

From the old but inaccurate maps the applicant assumed that by crosscutting from the shaft on the 1400 level the downward extension of the ore zone would be cut and ore exposed as ribs and as wide as above. The applicant did not find this zone as pictured on the maps, but did open a stope to the south containing very rich ore. As the applicant has spent all his money looking for the ore zone and not finding it helps in the form of money was needed. Thus it has suggested that a development program be based upon the study of the local geology.

Study of the local geology was limited to the 1400 level because the ore zone is traced from the surface to the 1330 stope. However the following facts were noted.

- ① A tremendous thickness of limestones occur at this mine ranging in age from Permian to the Cambrian.
- ② The limestones are practically horizontal with local flexures.

- (3) There are three systems of fractures namely - N 50°W and N 25°W which are true fractures and N 55°E to E-W for blind shales are not on bearing.
- (4) The present outcrops are probably in Pennsylvania Limestone and there still occur great thicknesses to the Cambrian.
- (5) One zone is limited vertically to within the V formed by the two intersecting ore fissures, and to replaceable limestone and clay beds none of which can now be observed.
- (6) On the 1400 level the intersecting fissures are weak probably due to the physical character of the beds on this level. In the top of 1402 stage the ore fissure is remarkable strong but it cannot be followed down through the limestone and thick shale beds.
- (7) The oil maps suggest a second or zone north of the drift also limited to west in the V of intersecting fissures. This was not seen but on the 1400 level by drifts or cross cuts.
- (8) It is useless to prospect for ore west of the fissure shown on the various maps.
- (9) Because of the flat lying beds

6

and in limestone beds susceptible to replacement. It is agreed that many beds have been exposed in the 1400 foot exposed rock. As there is only one ore zone and the beds practically throughout it is impossible to determine the favorable beds lower than the 1400 level. There are limestone beds all the way to the Cambrian of undetermined thickness and hence there may be any number of bed susceptible to replacement.

### C. Proposed Development

#### 1. Recommended plan of development

For the 1400 foot level you engineer and appraiser are in agreement that not more than 100 feet of drifting to the next 200 foot level cutting to done, at \$15.00 a foot this will amount to \$450.00. An addition about 100 feet rising should be done to extend the favorable beds further up or you, at \$30.00 a foot this will amount to \$300. A total of not more than \$750.00 should be spent in testing out the ore beds in the ore zone.

any ore should be developed by short  
passes and crosscuts limited to the  
ore zone which may be from  
20 feet to 100 feet.

(10) It is important to determine the  
number of ferrous ore beds that  
may occur for each 100 feet of depth  
will expose new slightly dipping beds  
that may or may not be ferrous  
to replacement by secondary copper  
sulfate solutions.

(11) This mine has had secondary enriched  
copper out of sulfates and agents of  
high grade from the surface to the  
1400 level a distance of 1600 feet. Therefore  
it is an unusual occurrence but not  
wholly unknown for oxidized copper  
ores are found at a depth of 1400 feet  
at Bushel, Arizona, also in limestones.

(12) There was not observed a single particle  
of sulfides ore or any indications of  
primary ore. Therefore it is unknown  
at what depths the oxidizer ore will extend  
and whether there will be a secondary  
giving sulfides. All of these occurrences  
are possible in limestone formations.

There discussion with the applicant and  
his superintendent a development program

based on what I have now discussed  
and limited to the following three  
points.

1. Cross cuts and drifts and roads on  
the 1400 level restricted to the ore  
zone.
2. Lengthening of drift to the 1500 level
3. Crosscutting drifts and roads on  
the 1500 level.

I recommend that this applicant be  
granted a loan for the above purposes;  
because:

1. Applicant's organization is already  
set up.
2. Applicant does not need any equipment  
or a mill to process the ore.
3. Project hasn't been mining and  
shipping ore and still at one  
stage.
4. The policy has been favorable  
for the application, but who  
knows what the favorable policies  
are when the beds are slightly  
dipping and new formations are  
exposed with each foot of  
depth. That is a feature no  
one can ascertain at this time.
5. All ore shipped from this  
mine has been high grade.

20° 15°  
36° 6°  
56° 9°  
13°

7.

The shaft should be sunk an additional 500 feet at a cost of 75 per foot. Preparation of the 1400 level (inclining to setting well) cost about \$500. Thus the shaft will probably cost about 10,000.

On the 1520 level a cross cut should extend to the ore zone within 250 feet. Drifting in the ore zone 500 feet and short cross cuts amounting to 500 feet should be done to a leg out test the ore zone. This should add the remaining \$12,500.

The main point in the development program is to stay within the ore zone and test the zone by numerous short crosscut and raises.

## 2. Recommendations concerning applicants and mining method

None.

## 3. Expected capacity of operation

- (a) Mining 20 tons a day.
- (b) Dug development 7 feet per 24 hours day.
- (c) Crosscut development, 7 feet per working place.
- (d) Raise development 5 feet per working place.
- (e) 200 milling

Charlie a Russ  
S. E.

Attachment

Plan of 140 level.

Sediment along A-A'

Sediment .. B-B'

Sediment .. C-C'

Plan of sub level.

1,8092

17, 2nd Juncyng, CO

51 George, Utah  
H. F. and R. Garfield Utah.Copied  
11.65 less 2.604

Date	Lot	an	ag	Pb	Cub.	Wtd, %	Tolison	Weight	Mtions	1 Day weight per ton	Gross value per ton	Shells per lb.	Net shells per ton	Total value	Freight per ton	Total Freight	Fed tax on freight 3%	Hauling per ton	Total Hauling	Fed tax on Hauling 3%	Total Freight + Hauling	Net proceeds	
Sep 11, 42	5	.01	.10	.5	28.97	.5	28.47	108000	12.7%	13716	94284	51.51	3.50	48.01	2263.29	4.51	243.54	4.00	216.00	459.54	1803.75		
11 16, 42	6	-	-	.6	27.95	.5	-	111540	12.9	14388	97152	49.66	3.50	46.16	3242.27	4.51	251.52	4.00	223.08	474.60	1767.67		
11 25, 42	7	-	-	1.1	21.40	.5	-	115160	16.0%	12668	102492	37.81	3.50	34.31	1758.25	3.98	229.17	4.00	230.32	459.49	1298.76		
Oct 1	8	-	.80	-	18.55	.5	-	114980	10.5	12072	102908	32.66	3.50	29.16	1500.40	3.45	198.34	4.00	229.96	428.30	1072.10		
Oct 6	9	.005	-	-	19.40	.5	-	106740	13.5	14416	92330	34.19	3.50	30.69	1416.80	3.45	184.13	4.00	213.48	397.61	1019.19		
11 12	10	-	.10	-	18.82	.5	-	116560	11.0	12522	103738	33.14	3.50	29.64	1537.40	3.45	201.07	4.00	233.12	434.19	1103.21		
" 24	11	.01	.10	.6	20.2	.5	-	112700	10.7	12058	100642	39.26	3.50	35.76	1799.48	3.98	224.27	4.00	225.40	449.67	1349.81		
Nov 3	12	-	.10	.5	18.2	.5	-	81020	13.0	10558	70662	32.02	3.50	28.52	1007.04	4.00	160.44	4.00	162.44	324.88	622.76		
Dec 8	13	-	.15	-	16.47	.5	-	115280	15.5	17868	97412	28.89	3.50	25.39	1236.65	3.25	187.33	4.00	230.56	417.89	818.76		
Dec 15	14	.005	.10	-	13.05	.5	-	105960	19.2	20344	85616	22.65	* 4.13	18.52	792.80	2.50	132.45	3.97	4.00	211.92	6.36	354.70	438.10
	15	.005	.75	-	18.17	.5	-	111180	18.8	20902	90278	31.69	413	27.76	1253.06	3.25	180.67	5.42	4.00	222.36	6.67	415.12	837.94

\* labor adjustment .63

## D. Equipment

1. Mine is completely equipped with
  - (a) Electric driven hoist - 1400 ft. cable.
  - (b) Electric " compressor.
  - (c) Mine cars.
  - (d) Rails, dull steel and acetylene welding equipment.
  - (e) Pump shop.
  - (f) Timber framing saw.
  - (g) ore bin.
  
- (2) Mine needs no new equipment for continued development -  
Supplies such as powder, caps, fuse, timber and tools will be purchased as needed and development program proceeds -
  
3. There are adequate buildings and housing facilities.

## E. Cost Estimations

1. Limestone replacement breaker
  - (a) Mining - 10.00 per ton
  - (b) Shipping - 15.00 per foot (5 x 7)
  - (c) construction, 15.00 " " (5 x 7)
  - (d) Passing 30.00 " " (6 x 6)
  - (e) 2 hr. setting 75.00 " " the compartment.
  - (f) Haulage mine to railway 76 miles  
Crude oil - 5.00 plus 3% tax = 5.15
  - (g) Freight 3.75 per ton plus 3% tax = 3.86
  - h. Smelting treatment = 4.13

~~2000~~  
~~200~~  
~~1000~~

~~11. 6. 5~~  
~~04~~  
~~9. 0. 4. 6~~  
~~5~~

400

~~14. 05~~  
~~4~~  
~~56.20~~

- i. Tumbs per 1000 at min. ~~40.00~~  
j. Total cost per ton, all inclusive  
30.00.

#### F. On Reserves.

1. Tonnage now developed.

unknown (but possibly 1000 tons)

2. Average value per ton ~~40.00~~

3. Estimated net operating profit per ton - ~~10.00~~

4. Tonnage to be developed by project.

Between 4000 and 5000 tons.

5. Average value per ton to be developed.

Based on past experience about ~~35.00~~ per ton.

6. Estimated net operating profit per ton  
~~25.00~~.

#### 7. Employment.

A. Number of men now employed on project.

1. Hostman man 25 cents hour

5 miners 85 cents "

4 muckers and trimmers 88 " "

Total 10 men.

B. Number of men to be employed under project  
Six additional men all shoftmen  
or miners 1.00 hour.

C. Number of shifts contemplated per 24-hour day  
3 in shoft.  
2 in mine.

## 8. Objections To Project

A. no local or regional objections

B. General remarks on admissability of project.

None.

## 9. Time schedule

A. Six months from time money is allocated to the applicant.

B. Length of operating season is 12 months a year.

C. Total time to repay loan two years.

## 10 Estimated Cost of Project

### A. Total development

①	100 foot two compartment shaft at 75 per foot	7500.00
②	1400 feet level — 300 feet dry tailing 15' 11"	4500.00
③	100 feet raising 30'	3000.00
④	1500 feet level, 250 feet) crosscutting 15' 15"	3750.00
	300 n. " dry tailing 15'	4500.00

B. Purchasing supplies

1000.00

C. Construction none.

D. General Expense

6750.00

30,000.00